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Div. of Oil, Gas & Mining

AUG 12 2014

Beth Ransel
BLM Field Office Manager
82 E. Dogwood
Moab, UT 84532

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Document Date 8/12/2014



DWQ-2014-010536

Subject: Evaluation of Lisbon Valley Mining Company's
Proposal to Backfill the Centennial Pit

Dear Ms. Ransel,

The Division of Water Quality (DWQ) appreciates this opportunity to clarify our position and technical understanding of Lisbon Valley Mining Company's (LVMC's) proposal to backfill the Centennial Pit. This letter summarizes the information provided by DWQ during the July 18, 2014 regulatory teleconference, and addresses pertinent technical and regulatory issues for approving the mine plan revision. The following narrative supports backfilling as the preferred environmental alternative compared to the open pit, pit pool, and larger waste rock dumps that would result from the existing mine closure plan.

Background

The Lisbon Valley Mine was permitted by the Bureau of Land Management (BLM) in 1997 and has been in operation since 2005. The Environmental Impact Statement (EIS) (BLM, 1997) evaluated the post-mining hydrologic and geochemical conditions related to external waste rock dumps, open pits, and pit lakes or pools that would develop when groundwater in the Burro Canyon aquifer rebounded to pre-mining static water levels. DWQ issued a Ground Water Quality Discharge Permit (UGW370005) for the project in 1997 and the mine has submitted routine Monitoring Reports since 1998.

In 2011, Lisbon Valley Mining Company submitted a request to backfill the Centennial Pit at the Lisbon Valley Mine. LVMC submitted the backfilling proposal to BLM as a mine plan revision in October 2011 and met with BLM onsite in November 2011. BLM engaged the US Geological Survey (USGS) as technical assistance and requested additional information from LVMC in June 2012. LVMC responded to the USGS Information Request in July 2012 and submitted the environmental report titled *LVMC Final Backfill Evaluation for the Centennial Pit at the Lisbon Valley Mine, Utah* in October 2012 (ARCADIS, 2012).

The BLM requested additional information in November 2012 and in response LVMC submitted the *Updated Backfill Evaluation for the Centennial Pit at the Lisbon Valley Mine, Utah* on December 28, 2012. LVMC then met with BLM, USGS, and the Utah Division Oil, Gas and Mining (DOGM) on November 7, 2013 to discuss the backfilling proposal. DWQ attended via teleconference. The USGS requested more robust (kinetic) testing in addition to the meteoric water mobility procedure (MWMP) test data that had

been submitted previously. LVMC's consultants submitted the work plan for kinetic testing on November 18, 2013 (Whetstone, 2013) and received approval from BLM, DOGM, and USGS in February, 2014. The kinetic column testing was completed in late February and the results were included in the *Lisbon Valley Mine Updated Centennial Pit Backfill Evaluation* (ARCADIS, 2014) submitted on March 26, 2014.

DWQ has reviewed the kinetic testing results and revised backfilling report and considered the results in light of the Division's history, technical understanding and regulatory responsibility of the project. The following text is intended provide the succinct factual basis for DWQ's determination that the backfilling proposal is the preferred environmental alternative.

Current Conditions and Site Description

The groundwater hydrology at the Lisbon Valley Mine has been described in numerous reports. In summary, groundwater at the mine primarily occurs in two aquifers: the Burro Canyon aquifer, which occurs at depths of less than about 500 feet, and the N-aquifer, which includes the Entrada, Navajo, Kayenta, and Wingate Formations and occurs below about 850 feet (Whetstone, 2010). These two aquifer systems are separated by several hundred feet of low-permeability interbedded shale, siltstone, and silty sandstone (Morrison Formation and Summerville Formation). In the vicinity of the Centennial Pit, the Burro Canyon aquifer is only about 255 acres (0.4 square miles) in size and the horizontal extent is limited both by the subsurface topography of the Morrison Formation and by the major valley-bounding faults (ABC, 1996a; ABC, 1998; Whetstone, 2010; ARCADIS, 2014). Since 2005, groundwater in the Burro Canyon aquifer has been pumped down (i.e., de-watered) to provide water for mine processes and to allow mining of the Centennial Pit below the static water table. The aquifer was initially pumped at about 240 gpm, and flow rates have declined to less than 20 gpm as the Burro Canyon aquifer has been dewatered near the Centennial Pit.

Base Line Historical Water Quality Levels

Pre-mining baseline water quality for the upper aquifer (Burro Canyon) and lower aquifer (N-aquifer) were provided in the EIS (BLM, 1997) and numerous subsequent reports, including the 1998 Annual Update Report (ABC, 1998), semi-annual and quarterly monitoring reports, well completion reports, and Annual Update Reports (Whetstone, 2006, 2007, 2008, 2009, 2010). Historical data indicates that the pre-mining groundwater in the Centennial Pit was elevated with regards to Uranium above the drinking water standard; as a result, the groundwater has been classified as Class III Limited Use. Class III groundwater is not suitable for drinking but is protected as a potential source of drinking water after substantial treatment, and as a source of water for industry and agriculture. For constituents that already exceed drinking water standards, Utah water quality rules allow no increase over background concentrations (UAC R317-6-4.6).

Background concentrations for monitoring wells MW-2A and SLV-1A were determined for the discharge permit based on pre-mining water quality data from 1996 – 2007. These two wells were located within the footprint of the existing Centennial Pit, and have since been removed by mining. Due to their locations, these wells represent background water quality in the Burro Canyon aquifer below the Centennial Pit and show the pre-mining spatial variability of uranium in groundwater.

Table 1. Baseline Ground Water Quality

Uranium Concentrations (mg/L)	SLV1A	MW-2A
minimum	0.008	0.228
maximum	0.037	0.456
mean	0.021	0.341
Background Level (mean + 2SD)	0.032	0.461
Count	27	17
Permit Limit (1.5 x mean)	0.0315	0.5115

Kinetic Column Test:

Kinetic testing was performed using samples of exposed wall rock from the existing open pit (Whetstone, 2014, ARCADIS 2014). DWQ reviewed the testing methods and results, which are described in detail in the Lisbon Valley Mine Updated Centennial Pit Backfill Evaluation (ARCADIS, 2014). Rock samples used in the kinetic testing were collected in close proximity to the screened interval of former well MW-2A, and the leachates from the kinetic testing can be compared to baseline water quality from this well. Groundwater was in equilibrium with uranium in the Burro Canyon Formation before the saturated formation was de-watered and mined out. Therefore, uranium that leached from the kinetic column testing material was "elevated" compared to drinking water standards but not elevated above pre-mining water quality at well MW-2A. The maximum uranium concentration in the column leachates (0.2072 mg/L, Table 2) was less than half the maximum background groundwater from MW-2A (0.456 mg/L) and approximately 41% of the calculated Permit Limit (Table 1).

Table 2. Kinetic Column Leachate Concentrations

Uranium, dissolved: Range from 0.1375 to 0.1979 mg/L
Uranium, total: Range from 0.1616 to 0.2072 mg/L
Groundwater Quality Standard (R317-6), Uranium: 0.030

The kinetic column testing suggests that the interaction of backfilled waste rock and rebounding groundwater will result in lower uranium concentrations in groundwater than what was there historically. This is likely due to the fact that the most highly mineralized deposits have been removed by mining. The water quality in the backfilled pit is also expected to be significantly better quality than in a pit lake subject to concentration through evaporation. Under the backfilling scenario a pit lake will not form since waste rock will be backfilled to an elevation above the pre-mining static water level of 6,200 feet amsl. The cone of depression from pit de-watering for active mining creates a ground water gradient into the pit. After mining ceases and the pit is no longer actively de-watered it will likely take many years for equilibrium to be re-established owing to the very low amount of precipitation in the area and the presumed infiltration rate of 5% - 10% of total precipitation. The resulting chemistry will be better than a pit lake that evapo-concentrates salts.

Potential for offsite migration

DWQ has reviewed the data and have the following comments:

The Mining Facility is situated in a Northwest to Southeast trending graben that is bounded on many sides by faults (ABC, 1998; Whetstone 2006; Whetstone, 2010), including the main Lisbon Valley Fault which limits the extent of the N-aquifer in the project area. The faulting has created blocks of aquifer that are in principle, compartmentalized with minimal connection to surrounding aquifers based on water levels and general water chemistry. The new model presented in the revise backfilling report (ARCADIS, 2014) simulates groundwater rebounding using 5% runoff. The resulting groundwater quality is improved with regard to uranium relative to historic concentrations. Regional groundwater flow in the N-aquifer is in the East-Southeast Direction. Water quality outside of the Centennial Pit is generally of better quality, but remains Class II. DWQ's understanding of the data submitted thus far indicates minimal off-site migration will occur, due to the compartmentalization and limited extent of both the local perched aquifer and deeper "regional" aquifer.

Conclusions

The Burro Canyon aquifer is a perched, laterally discontinuous aquifer with Class III groundwater that naturally exceeds drinking water standards. Protection limits for uranium in this aquifer are set such that no

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increase in concentrations is allowed. The results of kinetic column testing on proposed backfill material indicates that water quality in the column leachates has lower uranium concentrations than in the pre-mining groundwater within the Centennial Pit.

Based on the above, DWQ approves of the backfilling of the Centennial Pit. Modeling and Kinetic Column Tests show that water quality will likely improve. Further, a pit lake and the associated TDS increase will not occur. Backfilling therefore is likely more protective than the current permit condition which allows increased TDS in N-Aquifer groundwater due to the formation of a pit lake which is simulated to leak through the Morrison Formation into the N-Aquifer.

References

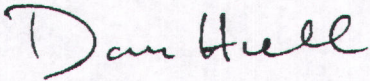
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Should you have any questions reading this letter, please contact Keith Eagan at (801) 536-4355 or Keagan@utah.gov.

Sincerely,

A handwritten signature in cursive script that reads "Dan Hall".

Dan Hall, P.G.
Groundwater Protection

cc: Lantz Indergard/Lisbon Valley Mining Company
Joe Manning/BLM
Terry Snyder/BLM

DH:KE:jn

DWQ-2014-009362